

New England. 23rd, moved northeastward, followed by clear weather in New England. Cautionary Signals ordered on the afternoon at Milwaukee and Grand Haven, and at midnight of the 21st along the Atlantic coast from Macon to Sandy Hook; and on the morning and afternoon of the 22nd, thence to Eastport, were justified except at Macon and Lookout. Maximum velocities:—Milwaukee, NW. 30; Grand Haven, SE. 28; Cape Henry, NW. 32; Cape May, NW. E. 40; Sandy Hook, 36; Thatcher's Island, SE. 30, and Eastport, SE. 36. As the pressure increased during the morning of the 22nd over the Southwest, a severe "norther" set in on the coast of Texas, for which Cautionary Off-shore Signals had been ordered on the afternoon of the 21st. They were justified by Indianola, N. 40, and Galveston, N. 32.

No. XIII was to the north of Montana on the afternoon of the 22nd. Its track was too far north to appear on the Chart.

No. XIV appeared on the Pacific coast on the 24th, but reports north of Portland, Oregon, are not yet at hand. At that station, after four days of comparatively high pressure, the barometer fell and by noon reached 29.68, or 0.35 below the normal, wind S.; during the evening and night the barometer rose and the wind veered to NW., and at 9 p. m. the pressure was lowest at Boise (29.81, or 0.38 below the normal.) At this time the wind had increased to a gale in western Montana, and easterly winds, with threatening weather were prevailing at Humboldt and Battleford, British America. 25th, lowest pressures from Montana to Manitoba; the barometer at Virginia City rising from 29.10, or 0.57 below normal, to 29.37, or 0.29 below normal, and falling at Pembina from 29.52, or 0.56 below, to 29.23, or 0.83 below; light snows or rains fell along the Pacific coast, over the western Plateau and at Virginia City, Fort Custer, Deadwood, and Bismarck. The pressure remained low over the Plateau Districts, and the low area arising therefrom will be described as area No. XVII. 26th moved to the northward of Lake Superior. Cautionary Signals were ordered at Milwaukee and Grand Haven, and justified by S. 28 and S. 26 respectively.

No. XV appeared over the eastern Gulf on the 25th, and moved slowly northward during the day. 26th, moved northeastward over Florida, preceded by NE. winds and rainy weather in the East Gulf and South Atlantic States. 27th, moved slowly northeast off the South Atlantic coast. 28th disappeared or merged into the area of low pressure over the Lake region (No. XVI.) Cautionary Signals ordered on the 25th on the North-Carolina coast; along the Gulf and Atlantic coasts from Port Eads to Wilmington on the morning of the 26th, and from Cape May to New York at midnight, were generally justified by winds attending either this area or area No. XVI; maximum velocities, Cedar Keys, S. 25; Savannah, NE. 32; Macon, NE. 35; Lookout, NE. 39.

No. XVI developed in the Southwest during the 26th as low area No. XIV moved into Canada. 27th moved rapidly northeastward to the Lake region unattended by precipitation or high winds. 28th passed rapidly to the Gulf of St. Lawrence.

No. XVII is the secondary depression that was left by area No. XIV over the Plateau Districts and remained there until the 28th. From the 26th to the 28th, stormy weather, with heavy snows, prevailed in California and the Southern Plateau district, of which interesting particulars will be found under the head of "snow." On the 29th it moved eastward in rear of high area No. XII, and preceded by easterly winds, rain or snow to the Lake region. 30th, moved over the Lake region with increasing energy, and on the 31st reached the Gulf of St. Lawrence. Cautionary Signals ordered up on the afternoon of the 29th at Milwaukee and Grand Haven, and along the Atlantic coast from Macon to Sandy Hook, and on the morning of the 30th thence to Eastport were justified. Maximum velocities: Milwaukee, W. 43; Lookout, NE. 39; Cape May, S. 36; Sandy Hook, SW. 48; Boston, W. 45, and Eastport, E. 32. At Boston the anemometer cups were blown away and the wind estimated at 60 miles.

No. XVIII passed eastward from Montana to Lake Superior on the 31st, accompanied by light snow.

INTERNATIONAL METEOROLOGY.

Three International Charts, Nos. IV, V and VI, accompany the present Review. No. IV indicates the probable course of the principal areas of low pressure over the North Atlantic ocean and neighboring waters and continents during the month of *December*, 1879; it is based upon observations made on board about 180 vessels, and which have been collected from various sources or received directly at this office up to February 5th, 1880. Nos. V and VI are charts for the month of *June*, 1878, and are based upon the International Simultaneous Observations, as described in the *Review* for July, 1879, supplemented by such other observations as have been considered specially applicable and trustworthy.

On chart No. IV the tracks of eight of the most prominent areas of low pressure, which, during a portion of their existence, were located over the North Atlantic ocean, are traced. In the following resume only that part of the ocean lying between the parallels of 35° and 55° will be referred to unless specially noted. The month opened with areas of low pressure over Europe, near the Azores, and to the north of Newfoundland. The first has already been noticed, as area No. XIV, chart IV, in the *December Review*; the second is a continuation of area No. XV, chart IV, of the same Review, while the third was probably a continuation of low area No. XVIII of the *November Review*. An extensive area of high pressure (over 30.40 inches or 772.1 m. m.) covered the ocean from 20° to 40° W and north of 45° N. The low area near the Azores, from which islands reports are not yet received, was probably central about 34° N 28° W, moving eastward. Steamer *Borussia* sailed from Coruna on November 26th, and had SE. winds which freshened to

a gale on November 30th; on December 1st, the wind suddenly chopped to NNW. with heavy cross-sea, during which she sprung a leak and foundered on the 2nd, 350 miles to the southwest of Fayal, having on board about 225 persons. Steamer *Columbo* in 32° N. and 29° to 39° W. had a continuation of westerly gales from the 1st to the 5th. North of Azores northerly winds prevailed between 10° and 20° W.; easterly thence to 40° W.; southerly to 50° W., and northwesterly thence to the coast of the United States, where a second area of high pressure existed. 2nd and 3rd, the low area south of the Azores moved to the Bay of Biscay, accompanied by very heavy seas, and producing severe easterly gales and heavy snows over the British Isles; the high area north of the Azores and the low area north of Newfoundland disappeared, while the high area on the American coast moved northeastward, and on the morning of the 4th extended from the banks of Newfoundland to 35° W; on the 3rd heavy easterly gales and high seas prevailed near the Bermudas. 5th and 6th, the low area moved rapidly eastward from the Bay of Biscay to the Black Sea, producing a slight rise of temperature to the south and east of its centre; with this exception, the cold period, which set in over western Europe during the first week of December, continued almost uninterrupted throughout the entire month. During the 5th, low area No. II, Chart I, *December Review*, passed eastward over Newfoundland and on the 6th was central about 55° N. 35° W., moving northeastward. 7th, low areas over mid-ocean and Canada; high areas over the east Atlantic and the Banks of Newfoundland; southerly to westerly gales in 55° N. 20° W.; northerly in 40° W. and southerly south of Nova Scotia. 8th, high area over the east Atlantic, extending over Europe, with very low temperatures; low area approached the coast of Norway inducing a temporary rise in temperature over northern Europe; southeast "hurricane" in 35° N. 23° W., and southeasterly winds thence northward to 50° N., along the western margin of high area; low area over Newfoundland. 9th, centre of high area was transferred to western Europe, over which region extremely low temperatures were recorded. At Paris, at 8 a. m. the thermometer registered -23.9° C. or -11° Fahr. Some hours earlier a temperature of -28° C. or -18.4° Fahr. was recorded on the surface of the snow. These are probably the lowest temperature readings ever recorded in this vicinity; during the winters of 1788-9, 1794-5 and 1871-2, -21.5° -23.5° and -21.3°, respectively, were recorded, these being the lowest readings since 1700. In the British Isles the mean temperature for the week ending December 8th of seven stations in the Midland counties, when compared with the mean of the same week during thirteen previous years, shows a deficit of 19° Fahr.; minimum readings ranging from -11° Fahr. (-23.9° C.) to -2° (-18.9° C.) were registered at various places from the 2nd to the 7th. On the 9th a low area existed in the vicinity of the Azores; ship *Peruvian* was dismasted in a southeast hurricane and abandoned in about 43° N. 27° W.; high area over the western Atlantic. 10th and 11th, low area over mid-ocean, attended by southerly gales from 15° to 25° W. and northerly gales about 40° W.; high area over western Atlantic. 12th, southerly winds and rising temperature from British Isles to 30° W., northerly gales in 45° W.; a low area passed eastward north of Newfoundland. 13th, southerly winds and rain over the eastern Atlantic; high area over western Atlantic. 14th and 15th, high area moved eastward over the western Atlantic, followed during the latter day, by low area No. VIII, chart I, *December Review*. 16th to 20th, low area moved east-north-eastward from Newfoundland; southerly winds prevailed from the British Isles to 30° W, but thence westward westerly gales and high seas, accompanied from 17th to 20th by snow or hail squalls. 21st, the low area moved northeastward off the Irish and Scotch Coasts; steamer "*Hibernian*" at noon in 54° N. 18° W., had a west by north wind, force 7, barometer 29.68. From this day to the end of the month low pressures generally prevailed to the north of the 55th parallel, and during this period at least three distinct low areas can be traced from Newfoundland eastward. Severe westerly gales continued to prevail almost without intermission, across the Atlantic from Ireland to Newfoundland and extremely cold weather, with severe snow and "hail" squalls were experienced from 25° W. to the Banks of Newfoundland, while a decided rise in temperature took place over northwestern Europe. On the morning of the 21st a low area passed rapidly eastward over Newfoundland which was encountered by the "*Hibernian*" on the 22nd in 54° N. 23° W., lowest barometer 29.63 or 752.6, wind WSW. force 9. On the evening of the 23rd another low area passed over Newfoundland, which was encountered by the *Hibernia* on the 25th in 52° N., 33° W., and by the *Leipzig* in 50° N., 20° W., between 6 and 9 p. m. During the 27th it passed to the northward of the British Isles accompanied by very severe gales thence to the coast of Norway. On the 25th another low area passed eastward over Newfoundland; was experienced by the *Hibernian* on the 26th, in 51° N., 37° W., lowest barometer, 28.85 or 732.7, violent WSW. gale, (force 12,) with terrific squalls and high seas; by the *Leipzig*, from 8 to 11 p. m., in about 49½° N., 23° W.; barometer, 29.60 or 751.8, remaining low all night and morning of the 27th; and by the *Rosend Castle* in 57° N. 19° W. On the 28th it passed rapidly eastward over the British Isles accompanied by hurricane winds; at 7 p. m. the "Tay-bridge disaster" occurred. 9th, high pressures prevailed over the Atlantic, with continued cold westerly gales and very high seas; low area, with high temperatures over northern Europe, while the high area over that continent moved southward to the Mediterranean accompanied by low temperatures. During the latter part of the day the pressure gave way over the western Atlantic and another low area covered Newfoundland on the 30th, which by the 31st had moved eastward to 35° W.

TEMPERATURE OF THE AIR.

The general distribution of the temperature of the air is shown by isothermal lines or figures upon chart No. II. On the right side of same chart is a table giving the average temperature, by districts, of